CLAIM AMENDMENTS

1. (currently amended) A method for determining a frequency profile of a quartz crystal, comprising:

a) subjecting the quartz crystal to temperature cycles at various temperature rates;

b) monitoring the crystal frequencies, a crystal temperature parameter, and the temperature rates as the crystal is subjected to the temperature cycles; and

c) grouping the monitored frequencies correlated with the monitored temperature parameters and temperature rates.

2. (currently amended) The method of claim 1, further comprising:

d) defining a surface in Cartesian three-dimensional space using the grouped frequencies, temperature, and temperature rates.

3. (currently amended) The method of claim 2, wherein the grouped frequencies are graphed on the Cartesian z-axis according to

$$z = f(x, y),$$

where x is a temperature value and y is a temperature rate.

4. The method of claim 3, further comprising performing an interpolation or extrapolation technique to derive missing points on the surface.

5. (currently amended) The method of claim 1, further comprising:

d) characterizing the crystal frequency (f) as a function of the monitored temperature parameters and temperature rates according to

$$f = f(T, \dot{T}),$$

where T is a temperature parameter and [[.]] $\dot{T} = \frac{dT}{dt}$.

6. (currently amended) The method of claim 5, further comprising:

e) graphing the crystal frequency $f = f(T, \dot{T})$ to define a surface in Cartesian three-dimensional space.

7. The method of claim 6, further comprising performing an interpolation or extrapolation technique to derive missing points on the surface.

8. The method of claim 1, wherein the crystal temperature parameter is one of a ratio of frequencies representative of temperature or a temperature value.

9. The method of claim 1, wherein the crystal temperature parameter is a temperature dependent frequency.

10. A method for determining a frequency of a quartz crystal, comprising:

   a) subjecting the quartz crystal to temperature cycles at various temperature rates;
   b) monitoring the crystal frequencies, a crystal temperature parameter, and the temperature rates as the crystal is subjected to the temperature cycles;
   c) grouping the monitored frequencies correlated with the temperature parameters and temperature rates;
   d) determining the temperature and a temperature rate of the crystal; and
   e) relating the determined crystal temperature and temperature rate to the grouped frequencies to determine the crystal frequency.

11. The method of claim 10, wherein step (c) includes defining a surface in Cartesian three-dimensional space using the grouped frequencies, temperature, and temperature rates.

12. The method of claim 11, wherein the crystal frequencies are graphed on the Cartesian z-axis according to

$$z = f(x,y),$$

where x is a temperature parameter and y is a temperature rate in the grouping.

13. The method of claim 12, further comprising performing an interpolation or extrapolation technique to derive missing points on the surface.

<u>14.</u> (currently amended) The method of claim 10, wherein step (c) includes characterizing the crystal frequency (*f*) as a function of the monitored temperature parameters and temperature rates according to

$$f = f(T,\dot{T}),$$

where T is a temperature parameter and [[.]] $\dot{T} = \frac{dT}{dt}$.

15. The method of claim 14, further comprising graphing the crystal frequency $f = f(T, \dot{T})$ to define a surface in Cartesian three-dimensional space.

16. The method of claim 15, further comprising performing an interpolation or extrapolation technique to derive missing points on the surface.

17. The method of claim 10, wherein step (d) includes determining the crystal temperature when the crystal is located subsurface.

18. The method of claim 17, wherein the crystal is disposed in a tool adapted for subsurface disposal.

19. The method of claim 10, wherein the crystal temperature parameter is one of a ratio of frequencies representative of temperature or a temperature value.

20. The method of claim 10, wherein the crystal temperature parameter is a temperature dependent frequency.

21. A method for determining a frequency of a quartz crystal, comprising:
   a) determining a temperature of the quartz crystal;
   b) deriving a temperature rate from the determined crystal temperature; and
   c) relating the crystal temperature and temperature rate to a data set characterizing a correlation between the crystal frequency, temperature, and temperature rates to determine the crystal frequency.

22. The method of claim 21, wherein the data set comprises a surface graphed in Cartesian three-dimensional space.

23. The method of claim 21, wherein the crystal frequency is determined in real time after determination of the crystal temperature.

24. The method of claim 23, wherein the crystal temperature is determined when the crystal is located subsurface.

25. The method of claim 24, wherein the crystal is disposed in a tool adapted for subsurface disposal.

26. A system for determining the frequency of a quartz crystal, comprising:
    a quartz crystal having a frequency output related to a temperature of the crystal; and
    a processor adapted to calculate a crystal frequency from a measured temperature parameter of the crystal, a temperature rate of the crystal, and observed frequencies of the crystal correlated with observed temperature parameters and temperature rates of the crystal.

27. The system of claim 26, wherein the processor is adapted to characterize a relationship between the crystal frequency (*f*) and the observed temperature parameters and temperature rates according to

$$f = f(T, \dot{T}),$$

where T is a temperature parameter and $\dot{T} = \frac{dT}{dt}$.

28. The system of claim 27, wherein the processor is adapted to perform an interpolation or extrapolation technique to derive the crystal frequency.

29. The system of claim 26, wherein the measured crystal temperature parameter is determined for a crystal located subsurface.

30. The system of claim 29, wherein the crystal is disposed in a tool adapted for subsurface disposal.

31. The system of claim 26, wherein the observed frequencies, temperature parameters, and temperature rates of the crystal form a data set in a storage device operatively coupled to the processor.

32. The system of claim 26, wherein the crystal is disposed within a thermally insulated chamber.

33. The system of claim 26, wherein the crystal is adapted with a heat conducting material on its surface.

34. The system of claim 26, wherein the crystal temperature parameter is one of a ratio of frequencies representative of temperature or a temperature value.

35. The system of claim 26, wherein the crystal temperature parameter comprises a number of counts of a temperature dependent frequency mode.